4. Iron Age Animal Bone

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4.1 Method

4.1.1 Excavation, sampling and recovery

The material from Segsbury was retrieved by hand collection from contexts associated with the hillfort.

4.1.2 Identification, Recording and Quantification

Sheep and goat bones have been distinguished where possible using the criteria of Boessneck (1969) and Payne (1985). Fragments that could not be identified to species level were classified as 'cattle-size' or 'sheep-size'. Small vertebrate identifications were checked against reference skeletons held by the Environmental Archaeology Unit, University of York.

The assemblage was recorded using a zoning method following Serjeantson (1996), fragments being recorded when over 50% of a zone was present. Ribs were recorded when the head was present and vertebrae (except axis and atlas) when over 50% of the centrum was present. This produced a basic fragment count, or number of identifiable specimens (NISP), for all taxa present (Table 4.1). Since differential fragmentation and survival may affect the relative proportions of species and anatomical elements present in an assemblage, the minimum number of elements (MNE) was calculated in addition to the NISP. This was based on the sum of the most frequent zone for each element, taking symmetry into account, and was calculated for the main domestic animals only. Minimum numbers of individuals (MNI) were then derived from the most common element in the MNE counts for these species, also taking side into account.

4.1.3 Ageing & Sexing

Wear stages were recorded for dP_4s, P_4s and lower permanent molars of the domestic species using Grant (1982) and grouped into age stages following the methods of Halstead (1985) and Payne (1973). The fusion stage of post-cranial bones was recorded and related age ranges taken from Getty (1975).

Sexes were separated using morphological characteristics of the pelvis in sheep and cattle (Grigson 1982) and of the canines in pigs (Schmid 1972). Although it is possible to detect the sexual composition of a population through metrical analysis the number of measurements produced for individual bones and species was small at these sites and precluded any conclusions.

4.1.4 Measurements

Measurements were taken on cattle, sheep/goat, pig and horse bones following von den Driesch (1976) and Davis (1992). Those taken on horse teeth followed Levine (1982). Measurements were compared with the measurements listed in ABMAP (http://ads.ahds.ac.uk/catalogue/specColl/abmap/index.cfm).

4.1.5 Gnawing, butchery and burning

For all identified bones (including 'sheep-size' or 'cattle-size') gnawing and butchery marks were recorded. Butchery marks were described as "chop" or "cut" marks. There were no bones that had been sawn. Their position was only recorded if considered particularly meaningful, but was not used for quantitative purposes. Gnawing marks made by carnivores and rodents were noted. Burning on bones was simply recorded as either present or absent.

4.1.6 Analysis

Material from securely dated contexts was divided into two phases, the Early and Middle Iron Age. Only the former was large enough to warrant detailed analysis. Segsbury is a hillfort lying on the chalk Ridgeway at the southern limits of the area generally known as the Upper Thames Valley and at the northern limits of the Wessex chalk downlands. The excavated assemblage is considered here within these regional contexts with reference to the recent review of Iron Age husbandry undertaken by Hambleton (1999). The few Early Iron Age assemblages from these areas are either from Thames Valley lowland sites on the gravel such as Ashville (Wilson and Hamilton 1978), Gravelly Guy (Mulville and Levitan 2005) and Yarnton (Mulville *et al.* forthcoming), or, from hillforts on the chalk such as Liddington Castle (Hirst and Rahtz 1996), Rams Hill (Carter 1975) and Uffington (Ingrem 2003). The hillfort assemblages, however, are rather small and hence excluded from Hambleton's review but are included here.

The site archive contains all the analysed material, including contexts that were designated as unphased (within the Iron Age) or mixed.

4.2 Results

A total of 1,527 fragments were analysed in detail (Table 4.1), they include eleven species of mammal and one species of amphibian.

Table 4.1: Iron Age animal bone from Segsbury

	Early Iron Age		Middle Iron Age		
Taxon	NISP	% Identified NISP	NISP	% Identified NISP	Total
Cattle	45	15	4	15	49
Sheep	11	4	0	0	11
Sheep/goat	145	48	21	76	166
Pig	36	12	1	3	37
Horse	13	4	1	3	14
Dog	3	1			3
Red deer	2	1			2
Fox	1	0.4			1
Water vole	3	1			3
Field vole	4	1			4
Small rodent	29	10			29
Frog	1	0.4			1
Cattle-size mammal	4				4
Sheep-size mammal	6		1		7
Unidentified	1063		133		1199
Total	1336		161		1527
Identified to species	303		28		331
% Identified	22		17		

The majority of the assemblage is derived from Early Iron Age contexts (90%) with only a small amount from the Middle Iron Age. Full analysis of the Early Iron Age assemblage was undertaken but the small size of the Middle Iron Age sample (28 fragments identified to species) precluded any detailed analysis and is briefly dealt with later in this report.

4.2.1 Early Iron Age

Preservation

As Table 4.2 shows, the visible evidence for taphonomic alterations is very low in the Early Iron Age assemblage. Gnawing damage was the result of canid activity; although rodent bones occur in the assemblage, the characteristic gnawmarks attributable to rodents were not observed. The prevalence of cut marks over chop marks is characteristic of Iron Age assemblages.

Table 4.2: Summary of taphonomic characteristics of Early Iron Age assemblage

	Butchered		Gnawed	Burnt	Loose Teeth
	Chopped	Cut			
n	1	6	9	3	73
%	0.4	2.2	3.3	1.1	27.1

The proportion of loose teeth in the assemblage has been quantified in Table 4.2. As these are particularly durable elements, surviving and remaining identifiable when mandibles and maxillae have disintegrated, the relative proportion of isolated teeth can be used to gauge the degree of fragmentation of the material. In this assemblage the proportion is quite high, suggesting a highly fragmented assemblage.

Main Domestic Mammals

The main domestic mammals, cattle, sheep/goat and pigs, account for most (78%) of the identifiable bone in the Early Iron Age assemblage (Table 4.1). Where sheep/goat bones could be speciated, only sheep was identified. Table 4.3 shows the relative abundance of these taxa using all three methods of quantification and with each the predominance of sheep/goat and the small quantity pig is apparent. Although less numerous, the larger cattle would have contributed more to the diet than the smaller sheep, with pork making up only a minor part.

Table 4.3: Relative abundance of the main domestic mammals

	%		
	Cattle	Sheep/Goat	Pig
NISP	22	74	5
MNE	22	75	3
MNI	30	60	10

Anatomical Representation

The distribution of skeletal elements for cattle and sheep/goat suggests that all stages of carcass processing and consumption are represented here, and the few pig bones present are also consistent with this interpretation (Table 4.4).

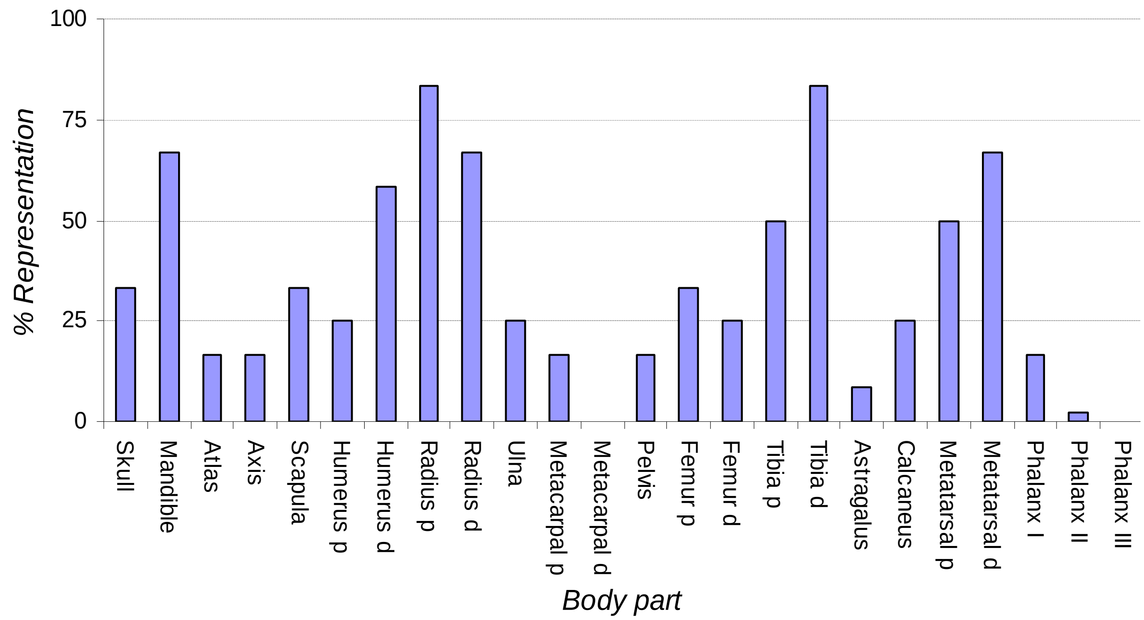
Table 4.4: Anatomical representation in the main domestic mammals

Element	Cattle	Sheep/goat	Pig
Horn core		1	
Nasal		3	
Occipital	2	2	
Zygomatic	2		
Mandible	2	8	1
Atlas		1	
Axis		1	
Scapula	3	4	
Humerus p	1	3	
Humerus d	1	7	
Radius p	3	10	1
Radius d	3	8	1
Ulna		3	
Pelvis	2	2	
Sacrum			
Femur p		4	
Femur d	1	3	
Tibia p	4	6	
Tibia d	3	10	
Patella	1		
Astragalus	1	1	
Calcaneus		3	
Navicular-cuboid		1	
Metacarpal p		2	
Metacarpal d	1		
Metatarsal p		6	
Metatarsal d		8	
Phalanx I	1	8	1
Phalanx II		1	
Phalanx III			
Total	31	106	4
MNI	3	6	1

p=proximal
d=distal

Only the sheep/goat sample is really susceptible to more detailed examination (Figure 4.1): the main discernible pattern is the predominance of mandibles, distal humeri, radii, distal tibiae and metatarsals. This distribution is mostly a result of preservation bias in favour of the more robust skeletal elements rather than the result of human activity. The under-representation of sheep/goat phalanges is probably a function of recovery method since these are small bones easily overlooked during excavation by hand. There is a noticeable discrepancy between the frequency of lower fore- and hindlimb bones (two metacarpals versus eight metatarsals), which could have resulted from preferential removal or destruction of forelimb bones.

Figure 4.1: Sheep/goat Anatomical Representation



The smaller cattle sample shows some similarity to sheep/goat insofar as the radius and tibia are the most common elements (save scapula). The near absence of the robust metapodials, suggests their deliberate removal possibly for bone working or with hides, since cattle phalanges are also infrequent. However, the sample size is too small for firm conclusions.

Ageing and Sexing

The only two recordable cattle toothrows (Table 4.5) come from the same context and, given the similarity in wear pattern, possibly from the same individual aged between 18 and 30 months (Halstead 1985).

Table 4.5: Toothwear (after Payne 1963 and Halstead 1985)

Species	Element	p4	P_4	M_1	M_2	M_3	Age stage	Age
Cattle	toothrow	j/k		g	d			18-30 months
	toothrow			g	c	U		18-30 months
Sheep/goat	mandible	e		a			B	2-6 months
	tooth	e					B	2-6 months
	tooth	f					B/C	2-12 months
	tooth	f					B/C	2-12 months
	tooth	f					B/C	2-12 months
	mandible	g		d			C	6-12 months
	toothrow	g		e			C	6-12 months
	tooth	g?						
	mandible	h						
	mandible		g	g	f		D onwards	over 1-2 years
	mandible	p		W	f		D onwards	over 1-2 years
	mandible	j		m	g		D onwards	over 1-2 years
	tooth					c	E	2-3 years

The fusion evidence is scant but supports the presence of immature animals, including a neonate (one radius), as well as adults (Table 4.6). The one sexable pelvis was from a female.

Table 4.6: Epiphyseal fusion

Species		UF	Total UF+F	% Unfused
Cattle	<1 year	0	2	0
	< 2 years	2	4	50
	< 3 years	0	1	0
	< 4 years	1	1	100
	sub-total	3	8	38
Sheep/goat	<1 year	4	16	25
	< 2 years	3	5	60
	< 3 years	3	3	100
	< 3 $^{1}/_{2}$ years	1	2	50
	sub-total	11	26	42
Pig	<1 year	3	3	100

UF=unfused F=fused

The toothwear evidence is more abundant for sheep/goat (Table 4.5) and although not amenable to strict allocation, suggests that most jaws and teeth came from animals between 2 and 12 months (Payne 1973). The fusion data are also consistent with large kill-offs in the first and second years with some survivorship into skeletal maturity. There is little evidence for older animals.

A partial piglet burial in Context (7613) included the skull, left and right scapula and radius, three vertebrae, 16 ribs, left ilium and left tibia of a neonatal individual. Also recovered from this context were a sheep metacarpal and a couple of sheep/goat loose upper molars. The sparse pig sample produced very little evidence for the age of the animals in the population: other than the piglet burial, the three other bones retaining fusion information were from animals killed at less than one year in age. A single mandibular canine was from a female pig.

Minor Domestic Mammals

Horse bones are the most frequent of the remaining domestic species and in fact are slightly more common than those of pig. The proportion of horse at Segsbury (expressed as a percentage of all cattle, sheep/goat, pig and horse) is six percent and lies within the range found at other Thames Valley Iron Age sites (Table 4.7).

Table 4.7: Early Iron Age Thames Valley Horse NISP data

Site	Horse	Total*	% Horse
Ashville	19	465	4
Gravelly Guy	162	2184	7
Yarnton	45	2425	2
Segsbury	12	216	6

* Total NISP for Cattle, Sheep/Goat, Pig and Horse
For site references see text

There are five isolated teeth and several hind limb elements (pelvis, femur, tibia, calcaneum, metatarsals); there is no indication that any of the latter came from an articulating group. If fusion is taken into account, a minimum of two individuals is represented. One of the metatarsals exhibited a disarticulation chop mark on the medial part of the distal end indicating some post-mortem carcass-processing; filleting marks suggesting further processing are absent.

Measurement of crown height on an isolated maxillary cheektooth (Levine 1982) yielded an age estimate of 14-18 years. Also present were two isolated deciduous maxillary cheek teeth, context (1698), which may have been from the same toothrow, and would have come from an animal no older than four years of age. The presence of immature animals at the site is also borne out by an unfused distal metatarsal shaft from an animal of less than 15 months and a proximal tibia epiphysis from an animal under 3.5 years, both, along with a fragment of horse pelvis, from context (1718), as well as a femur shaft from another young individual.

Dog is represented by only a few specimens: a proximal radius shaft to which the ulna has been fused by bone growth resulting from an infection and an adult distal metapodial and first phalanx from the same context, possibly the same individual.

Other species

Red deer (*Cervus elaphus*) is the only game animal present and is only represented by cranial elements: an isolated upper molar and a complete mandible.

An isolated M^1 was identified as fox (*Vulpes vulpes*), context (1554). As foxes burrow it is possible that this is non-anthropogenic in origin, although they have been recovered from other Iron Age sites, such as Yarnton (Mulville *et al.* forthcoming), Gravelly Guy (Mulville and Levitan 2005) and Winklebury (Smith 1977).

A few micro-vertebrate species are present. Small rodent bones occur at quite a high frequency in the assemblage, this is due to the presence of a field vole (*Microtis agrestis*) skeleton in context (1016). This same context also produced a fragment of water vole (*Arvicola terrestris*) skull comprising both maxillae. Further water vole specimens, two mandibles from different individuals, came from context (1720). A single amphibian bone was identified, a frog (*Rana* sp.) ilium.

Size

Measurements were taken on cattle, sheep/goat, pig and horse bones following von den Driesch (1976) and Davis (1992) and are shown in Table 4.8. The resulting dataset is small but comparison with the ABMAP database of measurements from southern English sites (http://ads.ahds.ac.uk/catalogue/specColl/abmap/index.cfm) suggests that the Segsbury animals were of average or slightly larger than average size compared to contemporary livestock.

Table 4.8: Measurements on Early Iron Age bones

Taxon	Element	Measurement					
Equid	P^3-M^2	Length	Breadth	Crown Height			
		26.0	22.0	27.1			
	Metatarsal	GL	Bp	Dp	SD	Bd	Dd
		249.0	45.3	39.3	27.9	45.8	35.5
Cattle	Radius	Bp	BFp				
		74.2	67.4				
	Tibia	Bd	Dd				
		48.3	37.0				
Sheep	Horn core	Greatest diameter	Least diameter	Basal circumference			
		32.0	17.6	86.0			
	Humerus	Bd	BT	HT			
		28.4	27.0	17.1			
	Radius	Bp	BFp				
		25.2	23.7				
Sheep/goat	Scapula	GLP	LG	BG			
		28.7	22.1	18.5			
	Humerus	SD	Bd	BT	HT	HTC	
		14.3	27.9	27.5	17.8	13.1	
	Tibia	Bd	Dd				
		22.5	17.1				

Pathology

Very few instances of pathology were observed: aside from the dog radius already mentioned, there was a pathological cattle mandibular condyle.

Several sheep-goat mandibles exhibited an accessory mental foramen, a non-metric trait that occurs on four out of the ten specimens where the relevant part of the jaw has survived. This is a relatively high incidence in the authors' experience although since it is a trait which has seldom been noted in published reports it is difficult to be sure.

4.2.2 Middle Iron Age

The fragments from this period included only 28 that could be identified to species (Table 4.1). The Middle Iron Age had evidence of juvenile horses in the presence of an unworn incisor but the rest of this small collection of material is again dominated by sheep/goat. There is a range of sheep/goat elements present but loose teeth comprise just over half of the material. The only elements of particular note were a single left mandible (animal aged 1-2 years) exhibiting congenital absence of the P_2 and a complete articulating left radius and ulna in context (1170). Cattle were represented by a loose tooth, an astragalus, metacarpal and second phalanx. No further comment can be made on this small assemblage.

4.3 Discussion

At Segsbury domestic animals were the mainstay of the food economy with sheep, cattle and pig dominating the assemblage. Segsbury is noteworthy for the very high level of sheep in the assemblage: at 74% of the total NISP for cattle, sheep and pig it is higher than at any Iron Age site in the Upper Thames Valley, where values range from ca. 30-60% for both cattle and sheep but pig is always least frequent (Hambleton 1999). A comparison with Early Iron Age Thames Valley sites demonstrates how unusually high the representation of sheep in the Segsbury assemblage is (Table 4.9).

Table 4.9: Relative abundance of main domesticates in Thames Valley sites

		NISP				% NISP		
Site	Phase	Cattle	Sheep/ Goat	Pig	Total	Cattle	Sheep/ Goat	Pig
Segsbury	EIA	44	150	10	204	22	74	5
Liddington Castle	LBA/EIA	97	216	42	355	27	61	12
Ashville	EIA	157	242	47	446	35	54	11
Gravelly Guy	EIA	733	1066	223	2022	36	53	11
Yarnton	EIA	1342	890	148	2380	56	37	6

For site references see text

As a hillfort lying high on the chalk Ridgeway, Segsbury is different to the majority of Thames Valley sites in Hambleton's (1999) study; most of these are low-lying settlements on the gravel and alluvium of the floodplains. Indeed the Segsbury data is more similar to Hambleton's Wessex/Central Southern England group where sheep predominate within the assemblages. Although even at these sites the highest proportion of sheep noted is 70% (Hambleton 1999).

Within the Wessex/Central Southern England data set Hambleton found that both altitude and site type affected the species proportions. Assemblages from sites located at 76-150m OD and hillforts tended to have more sheep; thus it appears that Segsbury has more in common with the Wessex hillforts in terms of animal husbandry than with the lowland settlement sites of the Upper Thames Valley. It may be significant that of the assemblages included in Table 4.9 the one with species proportions closest to Segsbury is the hillfort of Liddington Castle. Unfortunately, assemblages from the two hillforts closest to Segsbury, Rams Hill (Carter 1975) and Uffington (Ingrem 2003), are too small for useful comparison. Indeed, the particularly high frequency of sheep apparent at Segsbury may be related to the small sample size; with a NISP of only 204 this assemblage falls below the minimum reliable sample size of 300 recommended by Hambleton (1999) and in light of this it is worth pointing out that if MNI is considered instead of NISP, the contribution of sheep is reduced to 60%, a level more comparable with Liddington and the Wessex hillforts though still greater than in the assemblages from lowland Thames Valley sites.

Whilst sheep are numerically predominant in this assemblage, given the relative sizes of cattle and sheep carcasses, beef would probably have contributed more to the diet of Segsbury's inhabitants than lamb, mutton or pork.

The age at death information suggests a farming regime that focused on meat production for all species. The majority of animals died relatively young, although a number of adults were retained as breeding stock. Again Segsbury falls below Hambleton's (1999) recommended minimum for analysis so any interpretation of these results must be treated with caution. The dearth of data does not allow us to consider if cattle were kept for secondary products such as milk, or for traction. Data for sheep suggests the slaughter of surplus young animals for meat, although a fleece or two may have been collected before their death. There is little evidence for older animals with few fused bones or adult dentitions.

There was evidence for on-site breeding of cattle but no evidence for lambs. The absence of small, young, fragile bone could be ascribed to preservation and recovery or could indicate an extensive farming system with sheep breeding away from the settlement and only food animals returned to the site. The small amount of ageing information for pigs suggests that they too died young, killed for meat.

The young age of the sheep at Segsbury is a pattern found elsewhere in both the Upper Thames Valley and Wessex/Central Southern England. Hambleton found that many sites in this area were typified by high mortality in stage C, and in the Segsbury assemblage many mandibles fall into the B/C group.

All parts of the main food animals have been recovered from the site and, with both meat and waste bone present, this demonstrates that entire animals were butchered there. There is little evidence of a trade in meat. The absence of sheep metacarpals, particularly in relation to the number of sheep metatarsals, is of interest and suggests that these elements were preferentially selected for some purpose.

Horse remains form a significant part of the assemblage and also show a wide range in ages in the individuals represented. The presence of young animals at Segsbury adds to the debate on how horses were managed in the Iron Age. On-site breeding has been demonstrated for a number of Thames Valley sites: for example at Gravelly Guy (Mulville and Levitan 2005), Thornhill Farm (Levine 2004) and Yarnton (Mulville *et al.* forthcoming), whilst the absence of infants and juveniles at others has lead to suggestions that horses roamed free in wild-living herds until rounded up as young adults (Harcourt (1979) writing about Gussage All Saints). The estimated age of the youngest animal at Segsbury does not exclude the possibility that this individual could have been born wild and been brought to the settlement as a yearling in accordance with Harcourt’s argument. Once dead the carcasses of horses were utilised, although the butchery only points to the division of the carcass and does not demonstrate the filleting of horsemeat for consumption. Butchered horse bone is relatively common on Iron Age sites and is generally consistent with the exploitation of horses for meat.

Dogs were only represented by a few elements, and the presence of a pathological dog limb suggests that lame animals were tolerated. Dog bones are present at all Iron Age sites in small quantities and only appear in larger amounts within burials.

Wild animals play a very minor role in terms of food production; only two red deer bones were recorded. There is a very low incidence of wild mammals in most British Iron Age faunal assemblages (Hambleton 1999) and various authors have suggested that there was a proscription against the exploitation of wild animals in the Iron Age (Hill 1995). Unlike other Thames Valley sites, red deer antler is absent from Segsbury although the presence of a red deer jaw and upper tooth suggests that these animals were hunted, with at least their heads returned to site; red deer bones are also present in small numbers in the assemblages from other hillfort sites on the Ridgeway: Liddington (Hirst & Rahtz 1996), Rams Hill (Carter 1975) and Uffington (Ingrem 2003). The majority of deer bones found on southern Iron Age sites are waste bones with little meat value, and it may be that only particular parts of this wild animal could be brought back to site (Mulville *et al.* forthcoming).

Articulated bone groups (ABGs) are common at Iron Age sites and Segsbury has evidence for a single piglet partial burial in the Early Iron Age, four articulating cattle lumbar vertebra in the base of the Phase 4 rampart and a cattle skull in the ditch fill near the entrance (both unphased). All these fall within the definition of special deposits and are found in preferred locations for deposition (Hill 1995). Although the inclusion of pigs within articulated bone groups is rare, piglet burials have been recorded in Middle Iron Age and Romano-British contests at Gravelly Guy (Mulville and Levitan 2005), at the Middle Iron Age site of Mingies Ditch (Allen and Robinson 1993) and at Early Romano-British Yarnton (Mulville *et al.* forthcoming).

The cattle skull deposited near the eastern entrance is highly fragmented, but the pieces present constitute the majority of it with the left and right frontal, occipital, zygomatic and maxilla present. There is also evidence of post-mortem damage to the bone with canid gnawing present on the occipital condyles. This suggests a period of time between the loss of the articulating first vertebra and the burial of the skull during which a canid gained access. This suggests the skull was exposed on the surface of the ditch, or elsewhere, for sometime before being covered by ditch fill. The absence of ABGs within the larger earlier Iron Age contexts is of note, although it may be a product of the small assemblage size.

The data at Segsbury cannot be used to explore the proposed increase in production from the Early Iron Age to the Middle Iron Age, as the data set is too small. This assemblage has the expected range of animals present and demonstrates the exploitation of domestic animals, mostly for meat, and the occasional exploitation of wild species. In terms of species proportions Segsbury has more in common with the hillforts on the chalk of Wessex/Central Southern England than the lowland sites in Thames Valley, and it will be interesting to see if larger assemblages produced from any future work on hillforts of the Ridgeway also follow this pattern. The site is unusual in the very small number of older animals present, although the few neonates indicate that cattle were breeding at the site. The wide age range of horses is also of note and adds to the evidence on the procurement and management of horses in the Iron Age.

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